CLAIMS

1   1.   A method for a computer to present information to a user on one

2 of a plurality of available output devices, the method comprising:

3   (a) monitoring the user to collect information about a current state of the

4 user;

5   (b) modeling a current user condition based on the collected information

6 by,

7   determining a current level of privacy desired by the user, the

8 level of privacy indicating a group of people allowed to perceive information presented

9 by the computer;

10   determining a current scope of audience desired by the user, the

11 scope of audience indicating how many people are intended to perceive information

12 presented by the computer; or

13   determining a current cognitive load of the user, the cognitive

14 load indicating ability of the user to devote attention to the computer;

15   (c) receiving output information to be presented to the user; and

16   (d) presenting the output information in a manner consistent with the

17 modeled current user condition by,

18   selecting one of the plurality of output devices such that

19 information presentation capabilities of the selected output device support the

20 determined current desired level of privacy, the determined current desired scope of

21 audience, and the determined current cognitive load; and

22   presenting the output information to the user on the selected

23 output device,

24 so that the presentation of information by the computer satisfies the modeled current
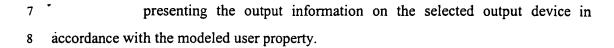
25 user condition.

1 2.   The method of claim 1 wherein the modeling of the current user
2 condition is additionally based on collected information related to a surrounding
3 environment.

1 3.   The method of claim 1 wherein the monitoring of the user is
2 performed by sensors worn by the user.

1 4.   The method of claim 1 wherein the monitoring of the user is
2 performed by sensors remote from the user.

1 5.   The method of claim 1 wherein the collected information
2 includes information about a current physiological state of the user.

1 6.   The method of claim 1 wherein the collected information
2 includes information about current activities of the user.

1 7.   The method of claim 1 wherein the computer is a wearable
2 computer.

1 8.   The method of claim 1 wherein an operating system of the
2 computer performs the method.

1 9.   The method of claim 1 wherein the output information is
2 received from a distinct program executing on the computer.

1 10.   The method of claim 1 wherein the output information is
2 received from another computer.

1   11.   The method of claim 1 wherein the output information is

2   generated by the computer during the monitoring or the modeling.

1   12.   The method of claim 1 including receiving description

2   information for the output information describing importance and deferability of the

3   output information, and wherein step (d) is additionally performed in a manner

4   consistent with the description information.

1   13.   The method of claim 1 wherein step (d) is deferred when the

2   output information cannot be presented on any of the available output devices in a

3   manner consistent with the modeled current user condition.

1   14.   The method of claim 1 wherein the available output devices

2   include two display devices with different information presentation capabilities

3   regarding level of privacy, scope of audience, and cognitive load, and wherein the

4   selected output device is the display device whose information presentation capabilities

5   best match the modeled current user condition.

1   15.   The method of claim 1 wherein information can be presented

2   with the available output devices to the user via at least two user senses, and wherein

3   the selecting includes determining the user sense via which the output information will

4   be presented.

1   16.   A computer-implemented method for presenting output

2   information to a user, the method comprising:

3   receiving information about a modeled property of the user which affects

4   appropriateness of presenting output information to the user;

5   selecting an output device capable of presenting the output information

6   in accordance with the modeled user property; and

7   presenting the output information on the selected output device in
8   accordance with the modeled user property.

1   17.   The method of claim 16 wherein the received information
2   includes information related to a current condition of the user, and including modeling
3   the user property based on the received information.

1   18.   The method of claim 17 including monitoring the user to collect
2   the received information.

1   19.   The method of claim 16 wherein the received information
2   includes information related to a surrounding environment, and including modeling the
3   user property based on the received information.

1   20.   The method of claim 19 including monitoring the surrounding
2   environment to collect the received information.

1   21.   The method of claim 16 wherein the modeled user property is
2   based on algorithmic modeling.

1   22.   The method of claim 16 including before the presenting of the
2   output information, receiving the output information.

1   23.   The method of claim 22 wherein an information provider
2   transmits information to various computers within a transmission range of the
3   information provider, wherein the method is performed by a transportable computer
4   transported by the user, wherein the user transports the transportable computer within
5   the transmission range, and wherein the received output information is the transmitted
6   information.

1   24.   The method of claim 16 including receiving description

2   information indicating importance or deferability of the output information, and

3   wherein the selecting is additionally performed in accordance with the description

4   information.

1   25.   The method of claim 16 including deferring the presenting of the

2   output information when no selectable output device is capable of presenting the output

3   information in accordance with the modeled user property.

1   26.   The method of claim 16 wherein the modeled user property is an

2   indication of a degree of interruptibility of current activities of the user.

1   27.   The method of claim 26 wherein the degree of interruptibility of

2   the current activities is influenced by information being received by the user via one

3   user sense in conjunction with the current activities, and wherein the presenting of the

4   output information is selected to be via a distinct user sense.

1   28.   The method of claim 26 including deferring the presenting of the

2   output information when the degree of interruptibility of the current activities is low.

1   29.   The method of claim 26 wherein the degree of interruptibility of

2   the current activities is low when the current activities involve a risk of harm to the

3   user.

1   30.   The method of claim 16 wherein the modeled user property is an

2   indication of ability of the user to devote attention to the presenting of the output

3   information.

1   31.   The method of claim 30 wherein the ability of the user to devote

2   attention is influenced by information being received by the user via one user sense, and

3   wherein the presenting of the output information is selected to be via a distinct user

4   sense.

1   32.   The method of claim 30 including deferring the presenting of the

2   output information when the ability of the user to devote attention is low.

1   33.   The method of claim 30 wherein the indication of the ability of

2   the user to devote attention is an estimate of an amount of attention devoted by the user

3   to other current activities.

1   34.   The method of claim 16 wherein the modeled user property is a

2   preference of the user for an amount of people to perceive presented information.

1   35.   The method of claim 34 wherein the selected output device

2   includes a range of information presentation capabilities, wherein others can perceive

3   information presented using some of the information presentation capabilities, and

4   including selecting those information presentation capabilities to be used for the

5   presenting when the modeled user property indicates that the others are within the

6   amount of people to perceive the output information.

1   36.   The method of claim 34 wherein the selected output device

2   includes a range of information presentation capabilities, wherein others nearby cannot

3   perceive information presented using some of the information presentation capabilities,

4   and including selecting those information presentation capabilities to be used for the

5   presenting when the modeled user property indicates that the others exceed the amount

6   of people to perceive the output information.

1   37.   The method of claim 16 wherein the modeled user property is a

2 preference of the user for how to receive sensitive information.

1   38.   The method of claim 37 wherein the selected output device

2 includes a range of information presentation capabilities, wherein others can perceive

3 information presented using some of the information presentation capabilities, and

4 including selecting those information presentation capabilities to be used for the

5 presenting when the modeled user property indicates that sensitivity of the output

6 information allows the others to perceive the output information.

1   39.   The method of claim 37 wherein the selected output device

2 includes a range of information presentation capabilities, wherein others nearby cannot

3 perceive information presented using some of the information presentation capabilities,

4 and including selecting those information presentation capabilities to be used for the

5 presenting when the output information is sufficiently sensitive that the modeled user

6 property indicates that the others are not allowed to perceive the output information.

1   40.   The method of claim 16 wherein the modeled user property is a

2 preference of the user for receiving information during current activities of the user.

1   41.   The method of claim 40 including deferring the presenting of the

2 output information when the preference of the user is to not receive the output

3 information during the current activities.

1   42.   The method of claim 40 including presenting the output

2 information non-intrusively when the preference of the user is to not receive output

3 information during the current activities.

1   43.   The method of claim 16 wherein the modeled user property is an
2   indication of appropriateness of presenting the output information in a manner
3   perceivable by others.

1   44.   The method of claim 43 wherein the selected output device
2   includes a range of information presentation capabilities, wherein others cannot
3   perceive information presented using some of the information presentation capabilities,
4   and including selecting those information presentation capabilities to be used for the
5   presenting when the modeled user property indicates that presenting the output
6   information in a manner perceivable by the others is not appropriate.

1   45.   The method of claim 43 including deferring the presenting of the
2   output information when the modeled user property indicates that presenting the output
3   information in a manner perceivable by others is not appropriate and available output
4   devices cannot present the output information in a manner not perceivable by the others.

1   46.   The method of claim 16 wherein the selected output device
2   includes a range of information presentation capabilities, and including formatting the
3   output information before the presenting, the formatting to select information
4   presentation capabilities of the selected output device to be used such that the selected
5   information presentation capabilities are consistent with the modeled user property.

1   47.   The method of claim 16 wherein a plurality of output devices are
2   available to present information via distinct senses of the user, and wherein the selecting
3   of the output device includes determining a user sense which is capable of presenting
4   the output information in accordance with the modeled user property.

1   48.   The method of claim 16 wherein the selected output device has
2   only a single physical mechanism for presenting the output information to the user.

1   49.   The method of claim 16 wherein the computer performing the
2   method is transportable by the user, wherein fixed output devices become available to
3   the computer when the user transports the computer near the fixed output devices, and
4   wherein the selected output device is a fixed output device.

1   50.   The method of claim 16 wherein a user computer performing the
2   method is transportable by the user, and wherein the user computer can communicate
3   with other devices within a transmission range of the user computer.

1   51.   The method of claim 50 wherein the user computer
2   communicates with another computer, and wherein the selected output device is an
3   output device of the another computer.

1   52.   The method of claim 50 wherein the received information is from
2   one of the other devices.

1   53.   The method of claim 50 wherein the output information to be
2   presented is received from one of the other devices.

1   54.   The method of claim 16 including after the presenting of the
2   output information, revising the modeled user property based on the presenting.

1   55.   The method of claim 16 wherein the modeled user property
2   indicates capabilities of the user for receiving presented output information.

1   56.   The method of claim 55 wherein the capabilities indicate that a
2   physical disability of the user prevents the user from perceiving some types of
3   presentations of information, and wherein the presenting of the output information is in
4   a manner perceivable by the user.

1   57. A method for a computer to model properties of a user for use

2 when presenting output information to the user, the method comprising:

3   receiving information about a current state of the user; and

4   for at least one of a plurality of properties of the user which affects

5 appropriateness of presenting output information to the user, modeling the property by

6   determining whether the received information relates to the

7 property; and

8   when the received information relates to the property,

9 determining a current value for the property based on the received information,

10 so that the determined current values of the modeled user properties can be used for

11 presenting output information to the user in an appropriate manner.

1   58. The method of claim 57 including:

2   receiving output information to be presented in accordance with the

3 determined current values of the modeled user properties; and

4   presenting the output information to the user in accordance with the

5 modeled user properties.

1   59. The method of claim 57 including when a program has output

2 information to present to the user, supplying the determined current values of the

3 modeled user properties to the program so that the output information can be presented

4 to the user by the program in accordance with the modeled user properties.

1   60. The method of claim 59 including when determined current

2 values of the modeled user properties change, automatically supplying the changed

3 current values to the program so that the output information can be presented in

4 accordance with the changed current values of the modeled user properties.

1   61.   The method of claim 57 wherein the determining of the current

2 value for the property is based on a plurality of modeling rules.

1   62.   The method of claim 61 wherein when the user is in a specified

2 class of users, using modeling rules specialized for the specified class.

1   63.   The method of claim 61 wherein when the user is not in a pre-

2 determined class of users, using default modeling rules.

1   64.   The method of claim 61 including updating the modeling rules

2 based on the received information so as to better model the user.

1   65.   The method of claim 61 wherein the computer can communicate

2 with another computer, and including receiving from the another computer new

3 modeling rules to be used for the determining of the current value.

1   66.   The method of claim 57 wherein the computer can communicate

2 with another computer, the another computer able to obtain information about the user

3 via input devices of the another computer, and wherein the received information is

4 obtained information about the user from the another computer.

1   67.   The method of claim 57 wherein the computer can communicate

2 with another computer, and including receiving from the another computer information

3 about properties of the user to be added to the modeled user properties, the added

4 properties distinct from the modeled user properties.

1   68.   The method of claim 57 wherein the computer can communicate

2 with another computer, and including receiving from the another computer a value for

3   one of the modeled user properties to be stored as the determined current value for the

4   one property.

1   69.   The method of claim 57 wherein the plurality of properties of the

2   user are modeled based on received information to create a model of a user condition.

1   70.   The method of claim 57 including monitoring the user to obtain

2   the received information.

1   71.   The method of claim 57 wherein multiple pieces of information

2   are received which relate to a property of the user, wherein the multiple pieces of

3   information are inconsistent as to the current value for the property, and wherein the

4   determining of the current value involves mediating the inconsistencies.

1   72.   The method of claim 57 wherein a rating indicating quality of the

2   received information is received, and wherein the quality rating is reflected in the

3   determined current values for the properties which relate to the received information.

1   73.   The method of claim 57 including:

2   determining that a current value for a user property is needed for

3   presenting output information to the user; and

4   obtaining information related to the user property to allow determination

5   of the current value.

1   74.   A method for presenting output information to a user of a

2   computer, the computer able to output information to a first display device and a second

3   display device, the first and second display devices having different display

4   characteristics, the method comprising:

5   selecting either the first display device or the second display device

6   based on a predicted preference of the user, the predicted preference indicating on

7 which of the display devices the user would prefer to receive the output information;

8 and

9   presenting the output information on the selected display device

10 consistently with the predicted preference.

1   75.   The method of claim 74 including predicting a current value of

2 the preference before the selecting.

1   76.   The method of claim 75 including monitoring the user to obtain

2 information for the predicting.

1   77.   The method of claim 74 wherein the predicted preference is a

2 predicted mental state of the user, and wherein a mapping between the predicted mental

3 state and the display devices is used for the selecting, the mapping indicating which of

4 the display devices are suitable for presenting information in accordance with various

5 predicted mental states.

1   78.   The method of claim 77 including:

2   after the presenting, monitoring reaction of the user to the presenting;

3 and

4   revising the mapping based on the monitored reaction to enhance user

5 reaction to future presentations of information.

1   79.   The method of claim 74 wherein the computer and the display

2 devices are designed to be carried by the user.

1   80.   A method for a wearable computer to present output information

2 to a user wearing the wearable computer, the wearable computer having a plurality of

3 output devices from which the user can receive information, the method comprising:

4   monitoring the user to collect information;

5   characterizing the user based on the collected information so as to

6   identify an ability of the user to currently receive the output information and a desire of

7   the user of how to currently receive the output information;

8   selecting one of the plurality of output devices such that information

9   presentation capabilities of the selected output device support the identified ability and

10   desire; and

11   presenting the output information to the user on the selected output

12   device consistently with the identified ability and desire.

1   81.   The method of claim 80 including receiving description

2   information indicating importance or deferability of the output information, and

3   wherein the selecting is additionally performed in accordance with the description

4   information.

1   82.   The method of claim 80 including receiving the output

2   information from an application program executing on the wearable computer.

1   83.   The method of claim 80 wherein the wearable computer has

2   multiple display devices worn by the user, the multiple display devices having distinct

3   information presentation capabilities, and wherein the selecting of one of the plurality

4   of output devices selects one of the multiple display devices.

1   84.   A computer-readable medium containing instructions for

2   presenting output information to a user by:

3   receiving information about a modeled property of the user which affects

4   appropriateness of presenting output information to the user;

5   selecting an output device capable of presenting the output information

6   in accordance with the modeled user property; and

7   presenting the output information on the selected output device in

8   accordance with the modeled user property.

1   85.   The computer-readable medium of claim 84 wherein the at least

2 one modeled characteristic is based on collected information related to the user.

1   86.   The computer-readable medium of claim 85 wherein the

2 computer system is further controlled by monitoring the user to obtain the collected

3 information.

1   87.   The computer-readable medium of claim 84 wherein the

2 computer system is further controlled by:

3   receiving the output information; and

4   receiving description information indicating importance or deferability

5 of the output information,

6 and wherein the selecting is additionally performed in accordance with the description

7 information.

1   88.   The computer-readable medium of claim 84 wherein the selected

2 output device includes a range of information presentation capabilities, and wherein the

3 computer system is further controlled by formatting the output information before the

4 presenting, the formatting to select information presentation capabilities of the selected

5 output device to be used such that the selected information presentation capabilities are

6 consistent with the at least one modeled characteristic.

1   89.   A computer system for presenting output to a user, comprising:

2   an output device selector module that receives information about a

3 modeled property of the user which affects appropriateness of presenting output to the

4 user, that selects an output device capable of presenting the output in accordance with

5 the modeled property, and that presents the output on the selected output device in

6 accordance with the modeled property.

1   90.   The computer system of claim 89 further comprising the selected

2   output device.

1   91.   The computer system of claim 89 further comprising a model of a

2   current condition of the user, the model including a plurality of user properties

3   including the modeled property.

1   92.   The computer system of claim 89 wherein the computer system

2   further comprises a user characterization module that generates the modeled property

3   based on collected information related to the user or to a surrounding environment.

1   93.   The computer system of claim 92 wherein the user

2   characterization module further monitors the user or the surrounding environment to

3   obtain the collected information.

1   94.   The computer system of claim 89 wherein the output device

2   selector module further receives description information indicating importance or

3   deferability of the output, and wherein the selecting of the output device is additionally

4   performed in accordance with the description information.

1   95.   The computer system of claim 89 wherein the selected output

2   device includes a range of information presentation capabilities, and further including a

3   format module that formats the output before the presenting, the formatting to select

4   information presentation capabilities of the selected output device to be used such that

5   the selected information presentation capabilities are consistent with the modeled

6   property.

1   96.   The computer system of claim 89 wherein the received

2   information is current physiological information about the user indicating a health

3   condition, and wherein the presenting of output is to another person to alert the another

4   person of a health problem detected from the current physiological information.

1   97.   The computer system of claim 89 wherein the received

2   information is current physiological information about the user indicating a health

3   condition, and wherein the presenting of output is to administer medical care for the

4   health condition.

1   98.   A data structure stored in the memory of a computer for use in

2   presenting output information to a user, the data structure containing modeled

3   information regarding the user, the data structure used by:

4   extracting information from the data structure including a current value

5   of a modeled ability of the user to currently receive the output information or of a

6   modeled desire of the user of how to currently receive the output information;

7   selecting an output device capable of presenting the output information

8   in accordance with the extracted information; and

9   presenting the output information on the selected output device in

10   accordance with the extracted information.

1   99.   The data structure of claim 98 including a defined interface to

2   receive updates to the modeled information from another computer.

1   100.   The data structure of claim 98 wherein the data structure further

2   contains a plurality of modeling rules useful for determining based on received

3   information about the user a current value for the modeled ability or desire.

1   101.   The data structure of claim 100 wherein the modeling rules are

2   useful for mediating inconsistencies between multiple pieces of information which

3   relate to the modeled ability or desire so as to determine the current value.